The coincidence between the lines of scarlet-fever and diarrhoeal diseases, to which attention was directed in the number of *Science* already referred to, is equally marked this month: in fact, they run so nearly parallel, that it is often impossible to distinguish them. The summer mortality has not yet commenced to show itself, but many weeks will not pass before we shall see its line gradually rising higher and higher, until it reaches its height in midsummer.

The meteorology for the month presents some interesting features. The rainfall was considerably less than in February; in the latter month 4.89 inches having fallen, while during March there were 2.83 inches, the actual time in which this amount fell being 2 days 20 hours 40 minutes. During the sixteen years 1869–84 this amount was exceeded in every year but four, so that March, 1886, was, in comparison with other years, a dry month.

Another point of interest in the meteorology of March of this year is the absence of snow. But an inch fell during the entire month, and that on the twenty-seventh day. During the period of sixteen years already referred to, so small an amount fell in only five years, while in some of the years the quantity was very great; notably in 1870, when 9.63 inches fell; in 1875, 15.25 inches; and in 1883, 10 inches.

It will be remembered that in February the highest reading of the thermometer was 52° F., and the lowest — 4° F. In March the maximum temperature was 62° F., and the minimum 8° F., the monthly mean for March being some 31° higher than that for the preceding month.

The population of the city of New York on March 1 was estimated to be 1,424,903, and increases presumably 799 each week.

POPULAR ASTRONOMY.

IN the 'Story of the heavens,' Dr. Ball presents to the popular reader an extremely entertaining account of the discoveries, researches, facts, and theories, of a science which, in a general way, is of interest to a larger class of people than any other department of learning. The book is specially directed to the non-astronomical; the style is strong and vigorous; and many points are elucidated in so striking a manner that even the professional astronomer, if modest enough, can get many a good suggestion from it.

Ambiguities and misstatements of fact are quite entirely absent. Dr. Ball appears to be rather less certain than the facts warrant, that the sun-spots are depressions; and he would find few astronomers, in this country at least, who would agree with him that the late Professor Watson probably discovered an intra-mercurial planet or planets during the eclipse of 1878. In parts of his work the historical method is pushed to the extreme. The complex theories of our astronomy will doubtless appear in the least difficult form if viewed in the light of the logical order of their dawning upon the philosophic mind; but the attempt to insist on this method of treatment appears, in some instances, to have led Dr. Ball into an unnecessary multiplication of wordy paragraphs. While thoroughly interesting and delightfully told, his 'Story' is, for all that, a pretty long one; and we cannot but think that it would have been better received, not to say more carefully read, if, by some such omissions as these, Dr. Ball had sooner brought it to a close.

Works on popular science, often a mere retailing at second or third hand of the labors of the professional investigator, are not infrequently filled with such misrepresentations of these labors as to be utterly misleading to the learner, not to say wrath-inspiring to those scientists whose work forms the unwilling subject of the story. Dr. Ball commits no offence of this sort: he is one of these investigators himself, but his own researches are not brought into undue prominence. We should, however, take exception to his account of the transit of Venus of 1882 as seen at Dunsink, where no observations of marked importance could be made, — an account which, therefore, cannot give a sufficient and characteristic view of the magnitude of the very extended operations conducted elsewhere on that occasion. We find no allusion to the abundant series of photographs of that transit, obtained by the American parties, which, it is safe to say, constitute the most important and successful record of a transit of Venus ever secured.

In some other parts, also, the 'Story of the heavens' is not well balanced. There is, perchance, the best of reason for being dissatisfied, or rather unsatisfied, with the present state of solar research. In the chapter on the sun, we find an exceptionally full description of the solar spots; but the question as to what they are is dismissed in a word. The progressive theories of the constitution of these objects form a most important contribution to the history of astronomy; and many a page in the book might better have been devoted to an outlined statement of these theories, and of what the spots, to say the least, seem likely to be. We should make much the same criticism of the author's treatment of that

The story of the heavens. By ROBERT STAWELL BALL. London, *Cassell*, 1885. 8°.

important but mysterious phenomenon, the zodiacal light.

No inconsiderable number of persons sufficiently interested in astronomy to read a book of this sort desire to become themselves observers; not with reference to making contributions of value to the science, but simply for their own advancement and edification. Early in his work, Dr. Ball has an interesting word for such readers, suggesting work well worth doing, and for which only an opera-glass is required. Why not have elaborated this idea more fully farther on, and with reference to various celestial objects within ready reach of slender telescopic means?

We are glad to see the care with which an abounding index has been prepared: it contains something like twelve hundred entries, and covers no less than eleven pages of the book.

In the last chapter, when treating of the tides, Dr. Ball is at his best. And by tides are meant, not alone the rise and fall of the sea as we note it to-day, but the term is used in its broadest sense, and the vast problems of tidal evolution dealt with in a wholly captivating style. This new departure in mathematical astronomy, as Dr. Ball justly terms it, is fully elucidated, and the non-mathematical reader owes him many an obligation for this clear and elegant exposition of the profound mathematical researches of Professor Darwin.

The illustrations are, as a whole, the best we have seen in any book on popular astronomy. A good many of them are new, a good many are borrowed with full credit, and yet others are borrowed without any credit. To the last class belong a number appropriated from Newcomb's 'Popular astronomy,' notably those on pp. 78 and 214 of the latter work, which are reproduced on pp. 104 and 228 of Ball. Presumably the charge of plagiarizing the text accompanying these illustrations would be sustained with difficulty; but it would be interesting to know how much time elapsed between Dr. Ball's reading of this text, and the writing of his own paragraphs on the effect of gravity on a projectile, and on the toothed-wheel method of determining the velocity of light. In our way of looking at it, subtracting the smoke from the lamp, and five teeth from the wheel, and supplementing the man's head with one shoulder and a mustache, fail to establish one's right to an illustration otherwise successfully 'conveyed.'

But Dr. Ball has not confined his attentions to a single work. In filling out his chapter on the sun, he found that something already written by somebody else would save him the drudgery of a page here and there, and he appears to have had no compunction in calling it his own. A few paragraphs from Young's 'The sun' and from Ball's 'The story of the heavens' are subjoined: —

YOUNG (p. 118).

"The average life of a sun-spot may be taken as two or three months; the longest yet on record is that of a spot observed in 1840 and 1841, which lasted eighteen months. . . . While some spots are thus long-lived, others, however, endure only for a day or two, and sometimes only for a few hours.

"The spots usually appear not singly, but in groups — . . . Very often a large spot is followed upon the eastern side by a train of smaller ones; many of which, in such a case, are apt to be very imperfect in structure, . . . When a large spot divides into two or more, as often happens, the parts usually seem to repel each other, and fly asunder . . . velocities of one thousand miles, and even more, are by no means exceptional.

"At times, though very rarely, a different phenomenon of the most surprising and startling character appears in connection with these objects: patches of intense brightness suddenly break out, remaining visible for a few minutes, moving, while they last, with velocities as great as one hundred miles *a second*.

"One of these events has become classical. It occurred on the forenoon (Greenwich time) of Sept. 1, 1859, and was independently witnessed by two well-known and reliable observers, Mr. Carrington and Mr. Hodgson, . . . Mr. Carrington at the time was making his usual daily observation upon the position, configuration, and size of the spots by means of an image of the solar disk upon a screen, . . . Mr. Hodgson, at a distance of many miles, was at the same time sketching details of sun-spot structure . . . They simultaneously saw two luminous objects, shaped something like two new moons, each about eight thousand miles in length and two thousand wide, at a distance of some twelve thousand miles from each other. These burst suddenly into sight at the edge of a great sun-spot, with a

BALL (p. 36).

"The average duration of a sun-spot is about two or three months, and the longest life of a spot that has been recorded is one which in 1840 and 1841 lasted for eighteen months. There are, however, some spots which last only for a day or two, and some only for a few hours.

"It should also be observed that the sun-spots usually appear in groups, and very often a large spot is attended or followed by a number of smaller ones, more or less imperfect. It often happens that a large spot divides into two or more smaller spots, and these parts have been sometimes seen to fly apart, with a velocity in some cases not less than a thousand miles an hour. On rare occasions a phenomenon of the most surprising character has been witnessed in connection with the sun-spots, where patches of intense brightness suddenly break out, remain visible for a few minutes, and travel with a velocity of over a hundred miles a second. One of these events has become celebrated for the extraordinary character of the phenomena, as well as for the fortunate circumstance that it has been authenticated by the independent testimony of the skilled witnesses. On the forenoon of the 1st September, 1859, two well-known observers of the sun, Mr. Carrington and Mr. Hodgson, were both engaged in observation. Mr. Carrington was employed at his self-imposed daily task of observing the positions, the configuration, and the size of the spots by means of an image of the sun upon a screen. Mr. Hodgson, many miles away, was at the same moment sketching some details of sun-spot structure. They saw simultaneously two luminous objects, shaped something like two new moons, each about eight thousand miles long and two thousand miles wide, at a distance of about twelve thousand miles

dazzling brightness at least five or six times that of the neighboring portions of the photosphere, and moved eastward over the spot in parallel lines, growing smaller and fainter, until in about five minutes they disappeared, after traversing a course of nearly thirty-six thousand miles."

YOUNG (p. 267).

". . . the temperature at the focus can not rise above that of the source of heat, the effect of the lens being simply to move the object at the focus virtually toward the sun; so that, if we neglect the loss of heat by transmission through the glass, the temperature at the focus should be the same as that of a point placed at such a distance from the sun that the solar disk would seem just as large as the lens itself viewed from its own focus.

"The most powerful lens yet constructed thus virtually transports an object at its focus to within about two hundred and fifty thousand miles of the sun's surface, and in this focus the most refractory substances — platinum, fire-clay, the diamond itself — are either instantly melted or dissipated in vapor. There can be no doubt that, if the sun were to come as near us as the moon, the solid earth would melt like wax."

BALL (p. 495).

". . . the temperature at the focus cannot be greater, cannot be even equal, to the temperature at the source of heat itself. The effect of a burning-glass is merely equivalent to making a closer approach towards the sun. The rule is indeed a simple one. The temperature at the focus of the burning-glass is the same as that of a point placed at such a distance from the sun that the solar disk would seem just as large as the lens itself viewed from its own focus. The greatest burning-glass which has ever been constructed virtually transports an object at its focus to within 250,000 miles of the sun's surface: in other words, to a distance of about 1-400th part of its present amount. In this focus it was found that the most refractory substances, agate, cornelian, platinum, fire-clay, the diamond itself, were melted or even dissipated into vapour. There can be no doubt that if the sun were to come as near to us as the moon, the solid earth itself would melt like wax."

By what name Dr. Ball would call this wholesale pillaging of others' books, we do not know; but it seems to us to fall little short of tallying with the work of the plagiary. Substituting 'greatest burning-glass' for 'most powerful lens,' and adding agate and cornelian to a list of refractory substances already fully long enough for the purpose of illustration, do not show any mark of great originality, while the continued effort to conceal the theft is petty in the extreme. We have not had the time to trace Dr. Ball's possible liberties with other authors than these, but our researches thus far have left us in the mood for suggesting that the titlepage of subsequent editions of his work might with some little show of justice contain the insertion 'compiled by ——.' Any one who cares to investigate further may perhaps like to judge for himself how much of pp. 495–505 in Dr. Ball's very interesting chapter on the 'Astronomical significance of heat' (the greater part) was directly suggested by a like number of pages at the end of Professor Young's chapter on the 'Sun's light and heat.' While in another part of his book Dr. Ball alludes to Professor Young as 'the well-known authority,' etc., in the chapter in question we find no mention of the name. Professor Young would doubtless be very glad to be of assistance to Dr. Ball, but we think he is human enough to care for the graceful acknowledgment of the service.

GEOGRAPHICAL NOTES.

Dutch statistics of population. — Kuyper has recently given an interesting discussion of the population-statistics of the Netherlands. The population for the whole kingdom is found to be 121.6 per square kilometre, and 75.0 for the lowlands, and varies from 265.9 to 44.6 for the same area in different districts. The females out-number the males by from one to two per cent. Of the population, 32 per cent are married; 61.55 per cent are Protestants, 36.02 are Catholics, and 2.04 per cent are Israelites, in religion; and, in occupation, 20 per cent are agriculturalists, 26 per cent laborers, 12 per cent merchants, 18 per cent manufacturers or mechanics, 2.5 per cent soldiers, 2.3 per cent engaged in religious, scientific, or sanitary professions. The increase of population from 1860 to 1880 varied from 12 per cent, in Limburg, to 30 per cent, in Holland proper. Of thirty-eight centres of over 10,000 inhabitants, one (Delftshaven) has doubled, seventeen have increased more than 25 per cent, and twelve others have increased from 10 to 25 per cent, during the same period. The work is supplemented by an instructive chart showing the increase of population for the period by single parishes, — a course only practicable in so small a country as Holland.

Search for mammoths in the Lena Delta. — Dr. Bunge has sent to St. Petersburg a chart of the Lena Delta, corrected during the numerous long journeys undertaken by him in search of frozen mammoths. His travels were more lucky geographically than biologically, for he found but one skeleton, and that deprived of head and one fore-leg. It had been exposed for ten years to the attacks of dogs, foxes, and natives, but had originally been covered with a thick coat of hair, which might have defended it against even the present climate of the delta, provided it could have obtained food to its liking.

Medals of Paris geographical society. — The great gold medal of the Paris geographical so-